DOCUMENT RESUME

ED 396 932 SE 058 597

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TITLE Making Grades: How High School Science Teachers Determine Report Card Grades.
PUB DATE Apr 96
NOTE 28p.; Paper presented at the Annual Meeting of the American Educational Research Association (New York, NY, April 8-12, 1996).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement; *Grading; High Schools; Interviews; *Science Teachers; Secondary School Science; *Secondary School Teachers; *Student Evaluation; Tests
IDENTIFIERS Alternative Assessment

ABSTRACT

A significant aspect of recent reform efforts is a strong move to change assessment techniques. When the focus of the reform is on changing teachers' practices of assessment and evaluation of students, the issue of how they incorporate the mechanisms of assigning grades into their teaching becomes important. The purpose of this study was to provide an in-depth look at the ways that teachers use the information that they have about their students from tests, quizzes, projects, book and lab reports, essay scores, and class discussion to arrive at a summative evaluation of the student's achievement in class. Data was collected using surveys and interviews. Findings suggest that a significant fraction of teachers use point systems for calculating report card grades where students collect points for their performance on tests and quizzes and for the completion of tasks such as lab reports and homework and then exchange these points for a grade at the end of the marking period. Other significant outcomes include the following: it appears that there has been little or no effect of recent reform efforts on the assessment practices of high school science teachers and there is some indication that science teachers appear to be enthusiastic about the use of computer software to aid in keeping their grading records and for calculating report card grades. Contains 14 references. (JRH)

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Making Grades: How High School Science Teachers Determine Report Card Grades

by
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Making grades: How high school science teachers determine report card grades

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Introduction

How do science teachers assign grades to their students? While this question might at first seem trivial, its answer is salient for those who are engaged in the reform of pre-college education. These reforms are focused on changing curriculum, pedagogy, and the ways that student learning is assessed (Helgeson, 1992). This effort can be seen nationally in the attempts to define what it means to know science and invent new ways to assess that knowledge (National Research Council, 1996), and in the new standards and assessments developed by the National Council of Teachers of Mathematics (1995). In Massachusetts, a systemic initiative for the reform of mathematics and science education funded by the National Science Foundation has been underway since 1991, and the state legislature recently passed major legislation to reform elementary and secondary education throughout the Commonwealth.

A significant aspect of the reform effort is a strong move to change assessment techniques (e.g., National Research Council, 1996; AAAS, 1993). Even given this, the saliency of the question of how teachers assign grades is not at first apparent because effects on practice are a secondary effect of assessment for policy making purposes. That is, while efforts such as the development of national standards may look towards the use of portfolios and performance assessments (California Assessment Program, 1990), these new evaluation tools are being considered to get a more valid indication of student learning rather than to have a direct effect on classroom teaching. But when the focus of the reform is on changing teachers' practices of assessment and evaluation of students, how they incorporate the mechanisms of assigning grades into their teaching can be of utmost importance.

A paper presented at the Annual Meeting of the American Educational Research Association, NY, NY, April 8-12, 1996.

ED 398 087

Given the interest among policy makers and teacher educators in changing the ways that teachers assess their students, little attention has been paid by researchers to the ways that teachers assign grades to students (Mead, 1992; Stiggens, Griswold, and Frisbie, 1986). Most of what is known is based on several research projects done on how teachers grade particular assignments (Mead, 1992) or what weight they place on various criteria (Agnew, 1985; Terwilliger, 1987; Mead, 1992; Nava and Loyd, 1992). This limited body of research indicates that, first, while for the most part teachers determine how their students are graded, "There is a remarkable consistency ... across all schools and all subject areas ... it seems at least a little amazing that there is so much agreement among teachers of all types (Agnew, 1985, p. 34)." Second, teachers' subject areas appear to be a large factor in determining what criteria and what weights for those criteria go into the grading decision (Agnew, 1985). Third, teachers use both achievement and non-achievement criteria (for example, classroom behavior) to determine grades (Nava and Loyd, 1992). And finally, while secondary teachers use a wide variety of data in assigning grades (Terwilliger, 1992), for the most part they rely on a traditional assortment of assessment devices (Agnew, 1985). Missing from this research is an in-depth look at the ways that teachers use the information that they have about their students from tests and quizzes, projects, book and lab reports, essays scores, and class discussion to arrive at a summative evaluation of the student's achievement in the class. Or more simply, "How do teachers decide what grade to put on the report card?"

The purpose of this study has been to answer this question. In doing so the researchers duplicated previous studies by asking teachers what importance they give to various assessment techniques and the basis on which they assign grades. The findings from the present study support the previous ones. But in addition, this study asked teachers about the ways that they calculate or otherwise determine report card grade s. The findings of this study suggest that a significant fraction of teachers use

point systems for calculating report card grades. In point systems students collect points for their performance on tests and quizzes, and for the completion of tasks such as lab reports and homework. They then exchange these points for a grade at the end of the marking period.

The remainder of this paper will describe the research methods and data analysis, and will conclude with the implications of this study, with particular attention paid to the significance of teachers' use of points systems.

Methods

The following questions were used to guide this study:

- What data do science teachers rely upon for assigning report card grades? What weight do science teachers put on different assessment techniques such as tests, quizzes, homework assignments, class participation, and project work? How do these techniques and weights vary according to geographic location of school (urban, suburban, rural), subject taught, years of experience of the teacher, and gender of the teacher?
- What are the frequency and distribution of point systems for the assignment of grades among secondary school science teachers? How does the frequency vary according to the variables listed in the first research question?
- To what extent do teachers and students participate in token economies that use points as the specie of exchange? How does participation in these token economies govern students' classroom behavior?

To answer these questions, data was collected through the use of surveys and interviews. The survey instrument consisted of three sections. Section I solicited the following background information from the teacher-respondents: type of school setting (urban, suburban, rural) and the percent of graduates who go on to college; and the gender, undergraduate major, highest degree attained, years of experience, and subject taught by the teachers. Section II is a list of 17 types of assessments. The teachers were

asked to indicate how much consideration they give each technique or factor in determining report card grades according to the following 5-point Likert-type scale:

1. Not used in this course for instruction or assessment purposes.
2. Used in this course for instruction but not for assessment.
3. Plays a small part in assessment for this course.
4. Is an important assessment tool for this course.
5. Plays an essential part in assessing students in this course.

Teachers were also given the opportunity to include and rate assessment types not included in the list. In Section III, teachers were asked to indicate which one of the following statements represents the primary basis that they use for assigning grades report card grades:

1. Achievement with respect to individual student ability.
2. Achievement with respect to other students of comparable age and grade level.
3. Achievement with respect to absolute standards of performance.
4. Achievement with respect to individual student improvement or growth.
5. Other (Describe below).

In the final section of the survey, teachers were asked to provide a specific example of how they calculate or otherwise determine the report card grade for an individual student in this course, and to use an actual example from one of their classes to illustrate the method.

The second instrument was a semi-structured interview schedule that was used to probe teachers' use of a particular type of grade determination mechanism called point systems that appeared in significant numbers in the responses to Section III of the survey instrument. The interview protocol solicited information from the teachers on how long they have been using point systems, advantages and disadvantages to their use for them and their students, how students accumulate points, and whether they perceive that students "see "points as rewards for doing school work or homework,

being "on-task," or behaving properly in class." Teachers were also given the opportunity to respond freely about their use of point systems.

Sample

The sample consisted of 91 high school science teachers who completed 110 survey forms. 43% (n=39) of the teachers were women, and 57% (n=52) were men. Most of the teachers in the sample were highly experienced: 82% (n=75) had more than 5 years experience, while only 3 were in their first year of practice. The sample of teachers also varied according to the science subject taught: 30% biology, 16% chemistry, 12% physics, 10% earth science, and 32% other including physical science, life science, environmental science, health, and math.

The sample of teachers came from the population of high school teachers in the three counties that surround the university at which the research was done. These counties include urban, suburban, and rural school districts. The science department chairperson, or other appropriate administrator, in each of the high schools in the region was contacted to see whether the science teachers in their school would participate in the study. Fifteen schools agreed to participate: 3 urban, 7 suburban, and 5 rural schools. It should be noted that several of the rural districts include old mill towns with high unemployment and therefore have significant numbers of "rural poor."

Data Analysis

Survey data

The multiple-choice survey questions were analyzed using standard descriptive and inferential statistical procedures using SPSS and Excel software.[1] Interview data was coded and analyzed using the methods described by Miles and Huberman (1984). Tables I, II, and III provide mean values for the importance of factors used by the teachers to determine report card grades. Table I gives means for all teachers and breaks

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[1]Special thanks to Lisa McLoughlin for her help with the statistical analysis.

it up into the various subjects taught. Table II does the same by teachers' experience, gender, and the setting of the school. Table III provides a ranking of the factors from most important to least by mean value and includes standard deviations.

From Table III it can be seen that on the average, only a small subset of these techniques are used regularly by the teachers sampled for assessment purposes: written tests, laboratory activities, written quizzes, and regularly assigned classwork and homework. That is, for high school science teachers, tests and quizzes, lab work, and traditional forms of class and homework make up the bulk of the factors that they use to determine report card grades. Project work, major examinations, performance assessments, and oral exams, tests, or quizzes are rarely used. And these teachers report that two forms of assessment that have been greatly encouraged in recent reforms are rarely, if ever, used by them for assessment purposes: portfolios and journals. It should be noted that only one non-achievement trait -- effort made by students -- was reported as being used in a small way for assigning grades. Other non-achievement traits -- student work habits, attendance, and behavior were reported as being rarely used if ever. These results appear to coincide with Nava and Loyd's findings that teachers report that the most important criteria for grading should include unit tests, announced quizzes, essays, or term papers, effort, and semester tests, and would probably include homework assignments, projects, and lab reports (1992). The two studies also agree that the only non-achievement trait identified as important for grading purposes was student effort.

Statistical testing indicates that there were no significant differences among teachers in different school settings as to the relative importance of different assessment techniques. However class attendance was deemed somewhat more important in urban and rural schools, and there was a slight preference for the use of journals in urban schools. It should be remembered, however, that overall the teachers reported almost no use of journals for assessment purposes. Urban and rural teachers reported less use of

laboratory work for assessment purposes, while suburban teachers rated lab work as a more important factor for assessment. Urban teachers also reported a lower rating for performance assessments.

There were significant differences among teachers of different subjects as to the importance of these assessment techniques for determining report card grades. Final exams were rated as less important by physical science teachers ($p<.05$). Oral exams were more important for biology teachers ($p<.05$), and less important for physics teachers ($p<.001$). Physics teachers rated lab work as important ($p<.01$). Chemistry teachers had a non-significant preference for lab work. In class projects were deemed less important by chemistry teachers ($p<.05$). Performance assessments were rated significantly lower by physical science teachers ($p<.05$). Portfolios showed the greatest variation of responses from teachers of different subjects. There was a slight preference for them by biology and earth science teachers, while chemistry teachers ($p<.001$) and physical science and physics teachers ($p<.01$) deemed them less important. Finally, chemistry teachers showed a significantly lower preference for the use of journals ($p<.05$). Again, it must be remembered that the teachers surveyed reported only slight use of portfolios or journals for assessment purposes.

While the data from this study agrees with Agnew's conclusion that teachers' subject areas determine in part grading practices (1985), it disagrees to some extent with other studies that indicated that there is no significant difference in grading practices among teachers of different subjects (Cizek, Rachor, and Fitzgerald, 1995; Terwillinger, 1987; Nava and Loyd, 1992). It is possible that the differences showed up in this study because it surveyed a much narrower population of teachers: all the subjects in this study were high school science teachers while the other studies mixed grade levels and subject areas.

While it was not statistically significant, there was some indication that biology teachers indicated a greater preference for portfolios, performance assessments, in class

projects, oral exams, and student work habits than did other science teachers. This suggests that biology teachers as a group may be more closely aligned with the reform effort in the use of alternative or authentic assessments in science.

There were few significant differences among teachers sorted by years of experience for any of these assessment techniques. Novice teachers rated oral exams and quizzes lower than experienced teachers ($p<.05$), and they also had a slightly lower preference for the use of performance assessments. There were no statistically significant differences by gender of the teachers. Women did favor written tests, and student effort and behavior slightly more than male teachers did.

Section III of the survey instrument asked teachers to indicate their primary basis for assigning grades. Half the teachers (50%) reported that they base students' grades on achievement with respect to absolute standards of performance. Twenty-eight percent stated that they based grades with respect to comparable students, 16% base grades on their students' individual ability, while only 2% base the grades on students' growth during the course (see Graph I). Cizek et. al. (1995) has found similar results -- most teachers in that study related final grades to achievement or fixed classroom goals. The findings of Wood, Bennett, Wood, and Bennett (1990) concur -- 90% of the teachers surveyed said that grades should reflect how much students have learned.

The survey questions in Sections II and III duplicated previous studies. The results indicate that these science teachers rely for the most part on traditional forms of assessment, and that recent reform efforts have had little effect on the factors that influence their decisions about report card grades. The responses to Section IV, however, provide previously unreported findings about the mechanisms that teachers use to arrive at the grades that they put on report cards.

Section IV asked teachers to supply specific examples of how they determine report card grades. The examples were sorted into five categories: point system, modified point system, weighted average, true average, and other (see appendix A for

examples of each). A large number of the teachers responded in ways that made it difficult to classify their responses. As a result, approximately one-third of the responses (36%) were put in the category "other." Even so, the two "points" categories accounted for 35% of the responses. Therefore, it appears that at least a significant fraction of the high school science teachers surveyed use point systems to determine report card grades.

The large number of responses classified as "other" made it difficult to determine if there were any demographic or contextual correlates to the use of point systems. Only two factors appeared to have any possibility of significance from the data: gender of the teacher and location of the school. Male teachers favored point systems slightly over averages, while women teachers favored averages slightly over points. A chi-square test indicated no statistical significance. Both urban and rural teachers favored points over averages, while suburban teachers were nearly equally divided. Again, a chi-square test indicated no significance to these differences.

Interview data

The literature on grading is almost devoid of any mention of point systems. Stiggens et. al. (1986) acknowledged, without reference to data, that teachers use a variety of mechanisms for determining report card grades, including averaging, points, and a sort of Gestalt method of arriving at the report card grade by examining marks in their grade books. More recently, Cizek et. al. (1995) described an industrial arts teacher who used "points" to encourage students to work in cooperative groups.

From this it can be seen that while point systems for the determination of grades were recognized at least 10 years ago, little attention has been paid to them. In particular, why do teachers use them, and how do they affect classroom climate and the relationship between teacher and student? Twelve teachers who reported using point systems in the survey were interviewed about why they began to use them, how long

they have used them, why they use them, and the effects that the point systems may have on their students.

When teachers use point systems for grading, they allocate certain numbers of points for each test, quiz, assignment, or task that they ask students to complete. The points accumulate over the course of a semester or year, and can easily number in the thousands. Students often have opportunities to add to their point total by completing extra credit assignments. It is important to note that point systems do not differentiate among the sources of the points -- once points are awarded to students, they are indistinguishable from one another and therefore have the same value. At the end of a marking period, teachers find the total possible number of points. Grades are then determined by dividing the points accumulated by a student by the total possible number of points. That fraction or percent is then often translated into a letter grade (see example in Appendix A).

It appears that for these teachers, point systems have originated in their practice rather than from education professionals such as university faculty or professional developers. Five of the teachers interviewed stated that they had always used point systems. One teacher "dreamed it up" himself, two learned from other teachers, two teachers began to use it as part of a "team decision," and two others began to use point systems as part of the computer grading software that they use.

Interview results indicate that teachers who use point systems are enthusiastic about them. The interviews produced a long list of advantages for the point systems with no disadvantages acknowledged by any of the interviewees. Teachers claimed that point systems are more quantitative, objective, and more scientific than other ways of determining report card grades. They said that point systems are less biased because they reduce the possible effects of their responses to students' gender or ethnicity. The teachers commented that point systems are straightforward, easy to comprehend, and allow students to not only know where they stand re their grades at any time, but also

allow them to easily calculate their own grades. Point systems also allow for better communication with parents and guidance counselors by providing a system to easily and quickly produce up-to-date cumulative records of performance through the end of the school year. The teachers also claimed that the point systems are more flexible than averaging or other systems. They can better accommodate group activities, and extra credit. Finally, teachers said they like point systems because it reduces students' tendencies to "grub" for points or argue for a higher grade.

When asked how students can get points, the teachers responded that they can be accumulated by completing assignments, by studying, and through extra credit. For the most part the teachers claimed that there were no points associated with behavior, and that by tying points to all assignments, in and out of class, it tells the students that "everything is important."

Finally, there was an attempt through the interviews to determine whether the teachers saw any direct link between points and classroom behavior. While all the teachers interviewed denied that points are a reward for proper behavior, they did acknowledge explicitly that points are a reward for the completion of assignments. One teacher acknowledged that the students "are aware ... that what they do translates into grades." A second teacher stated that "You build up these points, it's inevitable that you'll get a good grade." A third described the situation with students that are hard to motivate, "When I don't use points, especially with a hard-to motivate group, I don't get anywhere near the level of class participation." Finally, and probably most telling, "Grades are the currency that we use. The medium of exchange by which they feel good about [and can say] 'I did this work, I did this test, I did this lab and I got paid 50 points.' And that's a natural part of human behavior. We all like to receive something for what we do. And I think grading is a piece of that."

The interview data also suggests, and concurs with the responses to Section IV of the survey, that there is some link between the use of computer grading software and

the use of point systems. While neither the survey nor the interview were specifically designed to identify that link, teachers mentioned their use of the software in relation to point systems in their responses to the survey and to the interview questions.

Discussion and educational significance

There are three significant outcomes of this study. First, it appears that there has been little or no effect of recent reform efforts on the assessment practices of the high school science teachers surveyed in this study. They continue to base their students' report card grades primarily on traditional assessment techniques. Second, there is some indication that science teachers appear to be enthusiastic about the use of computer software to aid in keeping their grading records and for calculating report card grades. The use of this software is affecting the ways in which they relate to their students, and encourages the adoption of point systems for grading. Third, it appears that a significant fraction of the teachers surveyed use point systems for grading. Each of these findings will be discussed in turn in the remainder of this paper.

A look at Table II shows clearly that the science teachers who responded to the survey use traditional forms of assessment for determining report card grades. Only five forms of assessment -- written tests and quizzes, laboratory activities, and regularly assigned classwork and homework -- have mean values that indicate that they are being used in more than a small way by the teachers. Portfolios and journals, two of the assessment techniques most encouraged in the reform efforts, effectively do not appear in these teachers classrooms. Performance assessments, another feature of the reforms, has a slightly higher mean, indicating that they are used by some teachers. However, it was biology and earth science teachers who more often reported using them for assessment purposes. This may be due to the tradition of the use of "lab practicals" in these subjects. Again, the indication here is that secondary school science teachers have been little affected by attempts to move them towards the use of authentic or alternative assessments. The results here may be due to the nature of the sample, but given the

variety of schools, subjects, and contexts, there is the likelihood that these results are representative for the state, if not for the nation.

The second signifcant finding of this study is that many secondary school science teachers are using computers to aid in their grading. This software is generally in the form of a spreadsheet with rows for individual students and columns for the marks for specific assignments. Software examined in this study can be used for both averaging and point systems. However, it appears that there is some preference among teachers to combine the use of grading software with point systems. Again, readers must be reminded that the use of grading software was not a focus of this study, and so the data is incomplete. But the implications of the use of grading software are significant. First, the use of the software reifies the notion that grades are compilations in some way of quantitative measures of student achievement or ability. This is antithetical in some ways to the use of portfolios, journals, or exhibitions for assessment purposes, that suggest a more holistic view of student learning. Second, if the use of grading software tends to encourage teachers to use point systems, they may exacerbate the problems inherent in those systems, wh ich are discussed next. It is clear that additional research needs to be done to determine the effect that the use of grading software has on teaching and learning. As teachers become more computer literate, and computers become more ubiquitous in schools, the use of grading software may have a significant effect on classroom practice by acting against the reform efforts.

Finally, the appearance of point systems in the grading practices of a large fraction of the teachers who responded to the survey is a significant finding. This can be illustrated by two comments made by a teacher, Ms. Watkins, who uses a point system. First Ms. Watkins reported that she was troubled by her grading system because "students got higher grades than they deserved." And after a series of questions to determine how she determines report card grades, she stated, "Kids will do anything for

points. If I told them that they would get 10 points for running out to the parking lot and back, they would do it."

The first comment relates to point systems being token economies (Allyon and Azrin, 1968), in which the specie of exchange is the point. Students collect these points for their performance on tests and quizzes, and for the completion of tasks such as lab reports and classwork and homework. They then exchange the points for a grade at the end of the marking period, semester, or year.

As part of a token economy, points become devoid of information about the relative worth or importance of specific assignments or assessment techniques. For example, a student may accumulate a larger percentage of points through the completion of homework or classwork than for performance on tests or quizzes, thereby reducing the effect of the latter on the report card grade. This accounts for Ms. Watkins' first statement. Some of her students were doing poorly on her tests and quizzes, averageing C, D, or even F, but accumulating enough points through task completion to "buy" a report card grade of B. What this suggests is that point systems do not differentiate between task completion and learning. In fact, point systems may reinforce the idea in students' minds that the purpose of schooling is the completion of tasks, rather than learning.

Ms. Watkins' second comment is related to the possibility that teachers use point systems, either tacitly or explicitly, as a way to control students' behavior. While it is clear from the interviews done in this study that these teachers do not give students points for "proper" behavior, points are awarded for the completion of classwork, and therefore are a reward for staying "on-task." Therefore it is possible that teachers find point systems to be powerful classroom management tools.

It is clear from this study that the use of point systems is quite different from the use of portfolios and other alternative assessment techniques that stress a holistic view that superpositions student work on a variety of assignments and tasks to gather

information about student learning and performance. It is also apparent that the awarding of points can be tied to student behavior as well as academic performance. If science teachers use point systems to govern student behavior, they may be reluctant to abandon them in favor of the forms of assessment called for in the reform movements. Therefore, educational reformers need to be aware of science teachers' use of point systems if they are to develop and implement reforms that change teachers' assessment practices.

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Appendix A: Examples of grading schemes

Subject	Type of science and response to Section IV of survey	Grading scheme
5	Physical Science A. ALL work submitted receives a grade, although it's not necessarily based on a perfect score of "100" or an "A+". B. Book Checks - coming to class prepared with textbook appropriately covered will periodically earn 10 points C. Homework assignments are generally capable of earning a maximum of 20-25 points. D. Classroom assignments have a maximum value of 20-30 points E. Vocabulary quizzes are worth 60 points F. Chapter tests range in possible maximum value from 125 to 250 points--depending on the length/content of the particular chapter. G. "Special Projects", such as the Science Fair project, may be worth as much as 900 points! H. Each student keeps a record of his/her scores earned during each grading period on their own "grade grid" -- a chart which is filled out each Friday listing the description and the date of the assignments, the score received on each assignment, and the total points accumulated to date. Each student's total score is then ranked on the classroom blackboard. By doing so, each student will become aware of his/her current "letter grade" in this Physical Science class each week -- and also if there is any "make up" work owed due to an absence. (this information is on a form handed out to students. Students must also periodically return a note with a parent's signature, indicating that the parent is aware of the student's current point status.)	Points.

Appendix A (cont.): Examples of grading schemes

Subject	Type of science and response to Section IV of survey	Grading scheme
28	Physics - 12th Grade SCORE = points earned AVG. = class average POSS. = maximum points possible (here is a typical student's grade report)	Points

ASSIGNMENT	SCORE	AVG.	POSS.	% (letter grade)
1. Major Quiz Ch.1	37	42	50	74=C
2. Quiz Ch.2	DROP	28	30	N/A
3. LAB (measuring hgt.)	9	8	10	90=A-
4. Topic & Sources	27	24	30	90=A-
5. Test Ch. 3	87	78	100	87=B
6. Lab (D=M/V)	10	9	10	100=A+
7. Quiz Ch.4	29	27	30	96.6=A
8. Test Ch.4	90	78	100	90=A-
9. 50 Notecards	22	28	30	73.3=C
10. Quiz Ch.5	30	29	30	100=A+
11. Test Ch.5	58	62	100	58=F
12. Lab (Friction)	30	29	30	100=A+
13. Outline for term paper	22	26	30	73.3=C
14. Homework to date	46	44	50	92=A-
15. Term Exam	84	78	100	84=B
16. Classwork	45	44	50	90=A
TOTALS---------->	626	N/A	750	83.4=B

Appendix A (cont.): Examples of grading schemes

Subject	Type of science and response to Section IV of survey	Grading scheme
13	12th Grade Physics - --- 30% as follows ... - Quizzes (various point values) 9/12, 22/24, 23/25, 25/25, 18/20, 17/21, 14/14, 25/30 - Misc. homework or classwork 15/25, 14/15 ---> Points earned/possible points = 182 (+1 bonus)/211 = 86.7% --- 20% - Tests 88/100, 95/100 ---> 183/200 = 91.5% --- 30% - Labs (possible 20 points each) 19, 12, 17, 19, 19, 18, 19, 19, 18 ---> 160/180 = 88.9% --- 20% - portfolio / Writing Assignments 72/100, 84/100, 72/100 ---> 228/300 = 76% --- FINAL GRADE -- .3(86.7) + .2(91.5) + .3(88.9) + .2(76.0) = 96%	Weighted Points
19	"College Chemistry" Exams 35%, Quizzes 15%, Homework 10%, Labs 30%, Class Participation 10% EXAMPLE -- Quiz Avg. 85 x 0.15 = 12.75 Exam Avg. 92 x 0.35 = 32.2 Homework Avg. 95 x 0.10 = 9.5 Labs Avg. 88 x 0.30 = 26.4 Class Partic. 95 x 0.10 = 9.5 Final Overall Score --- 90.35 = A-	Weighted Average

Appendix A (cont.): Examples of grading schemes

Subject	Type of science and response to Section IV of survey	Grading scheme
68	11th Grade Chemistry : 50% of the grade is determined by grades earned on tests, quizzes, and the standardized ACS final. 40% of the grade is determined by the grade earned on Laboratory reports. We do a great deal of lab work in here. At a minimum, one double period per week. A written report is always required. For quantitative experiments (most are) a complete analysis - all data - calculations. The grade is determined by the thoroughness, analysis, and insight shown by the student. 10% of the grade is a subjective grade I assign to each student for behaviors as described in section II #'s 5,7,8,15,17, and participation in discussion through which I can learn a lot about their misconceptions and the depth of their understanding. EXAMPLE - 1st qtr. Tests+Quiz grades - 95, 82, 90, 88, 100, 98 - Avg. = 92 Lab Grades - C+, A, B, A-, B+, A -- Avg. = B+ (89) Daily Particip., etc. (Subjective grade) = A (95) 50% (92) + 40% (89) + 10% (95) = 92 Quarter Grade	Weighted Average
42	11th - 12th gr. Physics and Chemistry Each test, lab report, and homework average is given equal weight. At the end of the marking period, all grades are simply added together and then divided by the number of grades. EX: Tests -- 85, 62, 75 Labs -- 85, 90, 80, 95, 70 H.W. Avg. -- 92 --- >Add all these, then divide by 9 == 82 = B	True average
30	Woodland Ecology - 11th grade: Classwork ---- 30% Quiz Average - 40% Homework ---- 10% Projects -------- 10% Notebook ------ 10%	Other

Table I: Factors used to determine report card grades

Factor used to assign grades	all teachers	biology	chemistry	physics	physical science	other
1. Examination given at the end of the grading period.	2.88	2.97	3.20	3.56	3.09	2.72
2. Written tests (other than exam given at the end of the grading period).	4.22	4.34	4.55	4.18	3.83	4.05
3. Written quizzes.	3.76	3.80	3.60	3.73	3.67	3.85
4. Oral examinations, tests, or quizzes.	2.20	2.97	1.75	1.09	2.27	2.00
5. Laboratory activities.	4.13	4.23	4.53	4.60	3.73	3.47
6. Regularly assigned class work.	3.65	3.77	3.15	3.45	3.83	3.85
7. Regularly assigned homework.	3.69	3.71	3.45	3.64	3.67	3.75
8. Class presentations.	3.01	3.09	2.95	2.55	3.17	3.10
9. Major projects completed outside of class.	3.00	3.23	2.75	2.73	3.00	3.05
10. Major projects completed in class.	2.65	2.89	1.85	2.36	2.75	3.10
11. Performance assessments.	2.59	2.30	3.16	2.70	2.08	2.79
12. Portfolios.	1.47	1.63	1.00	1.18	1.92	1.85
13. Journals.	1.45	1.71	1.00	1.55	1.58	1.35
14. Class attendance.	2.40	2.69	2.10	1.91	2.50	2.11
15. Effort made by the student.	3.01	3.26	2.80	2.55	2.92	3.15
16. Student behavior in the classroom.	2.31	2.46	2.10	2.09	2.50	2.40
17. Student work habits (punctuality, neatness, preparedness, etc.)	2.78	2.67	2.65	3.09	2.67	3.11

1. Not used in this course for instruction or assessment purposes.
2. Used in this course for instruction but not for assessment.
3. Plays a small part in assessment for this course.
4. Is an important assessment tool for this course.
5. Plays an essential part in assessing students in this course.

Table II: Factors used to determine report card grades by teachers' experience and gender

Factor used to assign grades	all teachers	less than 5 years experience	more than 5 years experience	women	men	urban	suburban	rural
1. Examination given at the end of the grading period.	2.88	2.59	2.94	3.00	2.79	2.92	2.79	3.14
2. Written tests (other than exam given at the end of the grading period).	4.22	4.37	4.19	4.40	4.07	3.92	4.29	4.09
3. Written quizzes.	3.76	4.00	3.71	3.86	3.68	3.54	3.79	3.82
4. Oral examinations, tests, or quizzes.	2.20	1.63	2.32	2.35	2.08	2.38	2.24	1.90
5. Laboratory activities.	4.13	4.37	4.08	4.08	4.18	3.38	4.38	3.63
6. Regularly assigned class work.	3.65	3.84	3.60	3.50	3.77	3.69	3.63	3.59
7. Regularly assigned homework.	3.69	3.74	3.68	3.70	3.68	3.46	3.67	3.82
8. Class presentations.	3.01	3.26	2.96	3.24	2.82	2.77	3.10	2.95
9. Major projects completed outside of class.	3.00	3.26	2.95	3.04	2.97	2.92	2.97	2.95
10. Major projects completed in class.	2.65	2.95	2.59	2.68	2.63	2.62	2.67	2.55
11. Performance assessments.	2.59	2.00	2.71	2.69	2.54	2.08	2.57	2.91
12. Portfolios.	1.47	1.32	1.51	1.76	1.23	1.54	1.42	1.41
13. Journals.	1.45	1.42	1.44	1.60	1.30	1.92	1.44	1.18
14. Class attendance.	2.40	2.05	2.44	2.36	2.39	2.92	2.19	2.64
15. Effort made by the student.	3.01	3.16	3.01	3.38	2.75	3.00	2.97	3.36
16. Student behavior in the classroom.	2.31	2.68	2.21	2.68	1.97	2.00	2.29	2.45
17. Student work habits (punctuality, neatness, preparedness, etc.)	2.78	2.95	2.74	2.96	2.63	2.31	2.89	2.76

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Table III: Factors used to assign grades, ranked in order of importance for determining report card grades

Factor used to assign grades	MEAN all teachers	STDEV all teachers
2. Written tests (other than exam given at the end of the grading period).	4.22	1.02
5. Laboratory activities.	4.13	1.05
3. Written quizzes.	3.76	1.08
7. Regularly assigned homework.	3.69	1.09
6. Regularly assigned class work.	3.65	1.13
8. Class presentations.	3.01	1.20
15. Effort made by the student.	3.01	1.25
9. Major projects completed outside of class.	3.00	1.35
1. Examination given at the end of the grading period.	2.88	1.61
17. Student work habits (punctuality, neatness, preparedness, etc.)	2.78	1.11
10. Major projects completed in class.	2.65	1.44
11. Performance assessments.	2.59	1.32
14. Class attendance.	2.40	1.39
16. Student behavior in the classroom.	2.31	1.33
4. Oral examinations, tests, or quizzes.	2.20	1.30
12. Portfolios.	1.47	1.11
13. Journals.	1.45	1.05

1. Not used in this course for instruction or assessment purposes.
2. Used in this course for instruction but not for assessment.
3. Plays a small part in assessment for this course.
4. Is an important assessment tool for this course.
5. Plays an essential part in assessing students in this course.

Graph I: Basis for assigning grades